



DISTRICT HEATING PLANNING
WHITEPAPER



LINEAR
THE BIM ENGINEERING SOFTWARE



REHAU

Water
Technologies



MUNICIPAL LOCAL HEATING NETWORKS TO DECARBONIZE THE HEAT SUPPLY



Author

Olaf Kruse
Senior
Product Engineer &
Project Manager
Local Heating
REHAU Industries
SE & Co. KG, Erlangen

Municipal (local) heating networks play a key role in the decarbonized heating supply target scenario. Heat from various regionally available renewable energies can be provided more cost-effectively in many cases by means of heating networks - in contrast to supplying individual buildings. Municipal heat planning is the central instrument for determining the concrete potential for heat network suitability areas at the level of cities and municipalities.

Decarbonisation of the heating supply

Compared to the electricity supply, there is much greater pressure to act in the heating sector, as more than 80 % of the heating supply in Germany is currently still based on fossil fuels (1). The focus here is on existing buildings. Municipal heat planning (KWP) is the central instrument for identifying locally available renewable energies (RE) for possible (centralised) use and for developing a heat transition strategy with a specific catalogue of measures. As a result of the KWP, heating network suitability areas can be localised as well as areas for which an individual building supply based on RE makes sense. The federal law on the KWP has been in force since January 2024. Municipal heating plans are

to be available for all municipalities in Germany by mid-2028, and by mid-2026 for municipalities with more than 100,000 inhabitants (2). Example North Rhine-Westphalia: Here, implementation is flanked by a state law passed at the end of 2024, which is supported by a broad political base. Compared to all other federal states, the proportion of municipalities that have started the CHP process is the highest at more than 70 % (3).

Good reasons in favour of heating networks

Heat pumps will be the dominant heating system for individual buildings in the future. In densely built-up areas, combined solutions using heating networks often offer advantages. Renewable energy sources such as river heat or unavoidable waste heat from trade and industry as well as solar thermal energy can be tapped economically. In future, large heat pumps will be the main heat generators used here (Fig. 1). In addition, the utilisation of (solid) biomass offers regional potential.

Funding programmes for the construction and expansion of heating networks

The construction and expansion of a heating network infrastructure is associated with high levels of investment. At federal level, there are three relevant funding programmes for financial support.

a) KWKG

("Kraft-Wärme-Kopplungsgesetz")
Combined Heat and Power Act

b) BEW

("Bundesförderung effiziente Wärmenetze")
Federal subsidy for efficient heating networks

c) BEG

("Bundesförderung für effiziente Gebäude")
Federal subsidy for efficient buildings

Reliable framework conditions are essential for achieving this goal. This includes, in particular, sufficient funding for the federal subsidisation of efficient heating networks (BEW) that is independent of

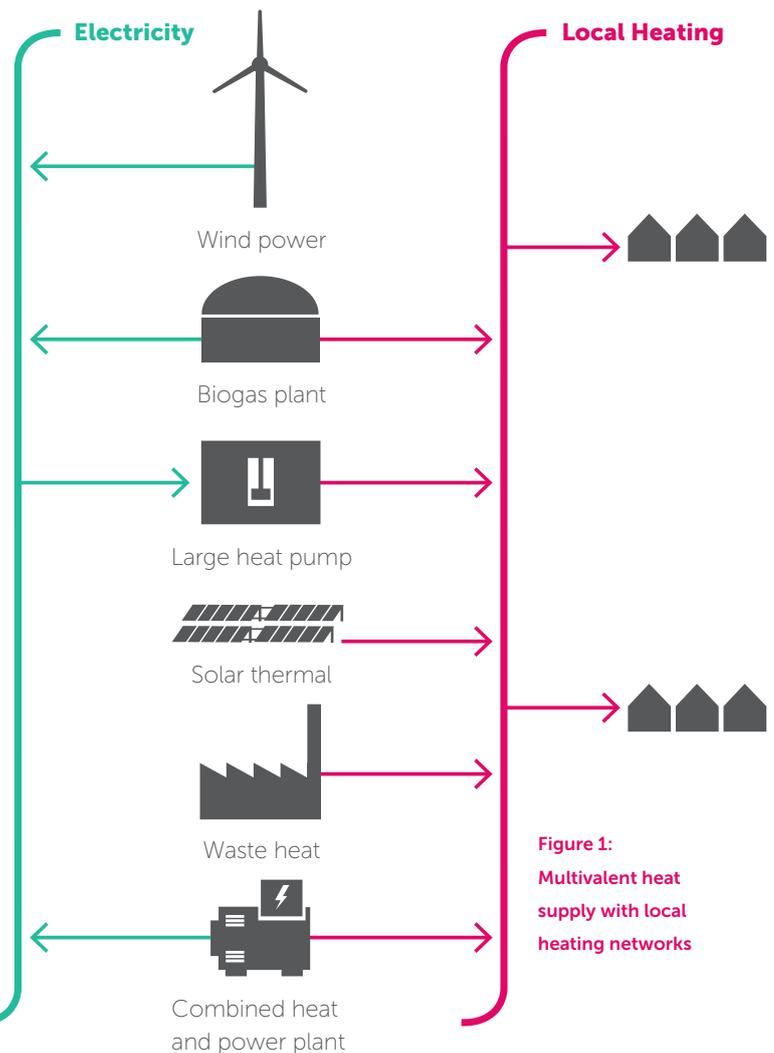


Figure 1:
Multivalent heat supply with local heating networks

the federal budget. There is a need for action on the part of politicians in the new legislative period.

The wave of expansion will come

Based on the KWP, it can be expected that new heating networks will be built or existing networks will be expanded in many cities and municipalities. Initial heating plans already completed in 2024 indicate this potential. Take Eschwege in northern Hesse, for example: The results of the CHP have been available for the small town with around 20,000 inhabitants in the Werra-Meißner district since April 2024 (4). According to the target scenario for heat supply in 2045, 38 % of the town's heat demand could be covered by a new heating network, which would essentially be fed by a large heat pump with green heat (Fig. 2). 50 % would then be supplied decentrally by air-to-water heat pumps, 2 % by brine-to-water heat pumps and the remainder

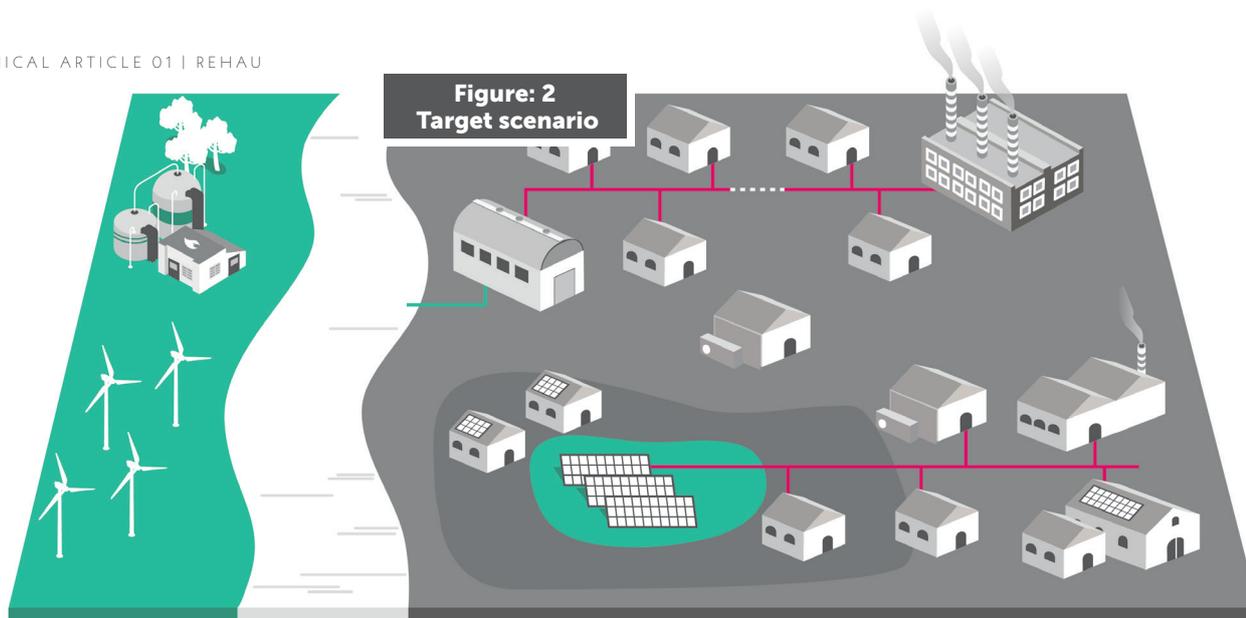


Figure 2
Target scenario

Figure 2:
Target scenario for heat planning in Eschwege with centralised river water heat pump (Source: Stadtwerke Eschwege GmbH (Colours adjusted for editorial reasons))

Figure 3:
Self-compensation for PMR, i.e. no measures such as expansion arches/pads required (source: REHAU)

Figure 4:
PMR house connection: maximum flexibility, e.g. when bridging the horizontal offset between the T-branch and house entry without any moulded parts (Source: REHAU)

Figure 5:
KMR single conduits Use of fitting pieces with a total of 2 x 4 weld seams to bridge a vertical offset (Source: REHAU)

Figure 6:
T-branch PMR double cable with simple connection technology using pressing instead of welding with a high level of safety thanks to visual inspection (source: REHAU)

by wood pellet boilers in combination with solar thermal energy. For comparison: Based on the existing gas network structure, around 80 % of the final energy demand in Eschwege is still covered by fossil fuels based on natural gas. According to the KWP, the economically competitive heat production costs for the heating network expansion areas are between € 140 and € 149/MWh (net with subsidy). Taking the BEG subsidy into account, the costs for the decentralised supply of small individual buildings with a heating capacity of 10 kW are in the range of € 210 to € 250/MWh (net with subsidy). The example of Eschwege thus impressively demonstrates the technical and economic potential for the expansion of municipal local heating networks.

Challenges and responsibility

The transformation of the heating supply towards climate neutrality is a task for generations. The responsibility for implementation lies with the cities and municipalities, based on the Heat Planning Act. Success depends, among other things, on providing sufficient resources and involving the population through good communication, public relations and transparency. Without acceptance, there will be no successful implementation. With regard to the construction of municipal local heating networks, the local municipal utilities as well as other energy suppliers and contractors are responsible. This is where the expertise lies or needs to be further developed. In addition, a great deal of engineering expertise is required for planning as well as capacity in civil engineering and pipeline construction in order to build and expand the heating infrastructure. The

omnipresent shortage of skilled labour, whether at municipal level or at municipal utilities and engineering service providers, is an obstacle. Measures that can help to simplify or speed up the process are in widespread demand.

Opportunities for accelerated network expansion

There is no alternative to the construction and expansion of heating networks with plastic-sheathed pipes („Kunststoffmantelrohrleitungen“ or „KMR“), i.e. with rigid steel media pipes, for large transport and main distribution lines due to the required transport capacity (pipe cross-sections) and the sometimes high temperature and pressure requirements in the supply networks. Beyond this, however, where the technical requirements allow it, openness to new or alternative technical solutions is required.

For operational implementation, it is an absolute gain if additional (new) capacities can be incorporated based on the use of flexible polymer pipe systems („polymerer Rohrsysteme“ or „PMR“). This includes, for example, civil engineering companies without special knowledge of KMR construction (e.g. required expertise and certifications for steel welding) or employees of municipal utilities. The advantages of PMR start with the planning process, which is simpler and faster. Thanks to the self-compensating nature of the pipework, neither pipe statics nor expansion bends are required (Fig. 3). The flexibility of the plastic pipes available as ring bundles can be utilised to advantage in the routing, e.g. when bypassing obstacles such as sewer pipes or manho-



les (Fig. 4). With rigid steel pipes, on the other hand, specially manufactured fitting pieces are required, e.g. in the event of a vertical offset in the route, which act as a cost driver (Fig. 5).

In PMR, a double pipe is widely used up to dimension d63/202 (specification with reinforced insulation) as a flexible system with a standard ring coil length of up to 75 metres. Double pipes are to be favoured especially in network operation due to the on average approx. 1/3 lower heat losses compared to single pipes. Single pipe systems generally dominate in KMR. The construction of double pipe systems is very challenging in terms of structural realisation, among other things with regard to the production of the weld seams at the joints. Conversely: If there is a possible change in technology from KMR single pipes to PMR double pipes, the cost advantage is also combined with an efficiency advantage due to a reduction in heat losses. When making a comparison, it is important to note that the cost advantage of PMR over KMR is not (primarily) achieved by the supposed saving in material costs. Rather, the cost reduction results from the overall consideration and inclusion of the different number of components and the effort involved in the necessary processing steps and, in particular, the additional savings in civil engineering.

The connection technology used in PMR, a sliding sleeve press system, is easy to process, extremely robust and, above all, safe (Fig. 6). The bottom line is that a PMR network (section) can be realised significantly faster. **Interim conclusion:** If technically suitable and with recognisable economic advantages, PMR systems and the combination of KMR + PMR should be used consistently in future, i.e. the best of both worlds should be used. With regard to

specific projects, a basic distinction should be made between three categories:

a) Isolated networks

The first completed municipal heating plans show that decentralised heating network suitability areas (districts) are also being identified away from larger urban (partial) networks, where flexible polymer pipe systems can be used due to the size and total heat output (and the required pipe cross-sections derived from this) as well as the maximum temperature and pressure requirements. Polymer pipe systems are already widely and successfully installed in new-build neighbourhoods and have proven their worth in practice through cost savings and significantly shorter construction times (5, 6).

b) Secondary networks

Hydraulic decoupling enables a reduction in network temperatures and pressure levels as a prerequisite for a change of material from KMR to PMR in the secondary network (Fig. 7).

Especially where district heating networks already exist and are being expanded, PMR secondary networks offer considerable



Fig. 6

Figure 7: Simplified schematic diagram of primary/secondary network with exemplary parameters for heat supply in existing buildings

Positioning | Basics | Advantages

What is a secondary network?

Olaf Kruse | REHAU Industries SE & Co. KG | 13.02.2025

... the hydraulic decoupling of a PMR network, for example, by means of a heat exchanger ... if the primary network is characterized by high pressure/temperatures and does not permit the use of PMR in the primary network.

Primary network	Secondary network
Flow temp. ...120...°C	Flow temp. ...85...°C
KMR	PMR
Return temp. ...80...°C	Return temp. ...55...°C
Pressure stage PN25	Pressure stage PN6

Fig. 7



Fig. 8

potential for reducing costs and accelerating implementation.

c) Hybrid networks

If the technical requirements for the overall network under consideration are met with regard to maximum operating temperature and pressure level, a hybrid network can be created. The design of the PMR component is not limited to the house connection lines, but generally includes the sub-distribution, e.g. in individual road sections. Which maximum dimension is economically advantageous for PMR compared to KMR depends on numerous boundary conditions. In individual cases, large PMR pipe dimensions are also preferred if the route has, for example, longer sections with many changes of direction and possibly vertical jumps, which would require a large number of moulded parts and fitting pieces with KMR. The interface from KMR to PMR can be realised, for example, by means of a parallel branch using universally weldable transition fittings, which are pressed on one side with the polymer pipes.

Practical examples of hybrid and secondary grids

Hybrid grids and secondary grids are not a new invention. There are already numerous successfully implemented projects that can set an example for the future. SOLARCOMPLEX AG, for example, has good experience with several hybrid grids that have been planned and built in the Lake Constance region and in the southern Black Forest over the last 10 years. Other projects in which the RAUTHERMEX polymer pipe system from REHAU was used in combination with KMR include those in Sebnitz near Dresden and Herbrechtingen/Baden-Württemberg.



Fig. 9

In Adelsdorf, a municipality with around 9,500 inhabitants 40 kilometres northwest of Nuremberg, climate protection is being driven forward with great commitment through the establishment and expansion of a hybrid network (Fig. 8 and 9). Initial experience with grid-connected heat supply was already gained in 2007 with the construction and operation of a district heating island network. The neces-

Figure 8: KMR main road in Adelsdorf (Source: REHAU)

Figure 9: Transition from KMR to PMR in Adelsdorf (Source: Adelsdorf municipal utilities)

Figure 10: Construction schedule for the Adelsdorf municipal local heating network 2025 to 2030 (Source: Adelsdorf municipal works)

Figure 11: Secondary grid B-Plan 39 of SWS Energie in Stralsund (Source: REHAU)

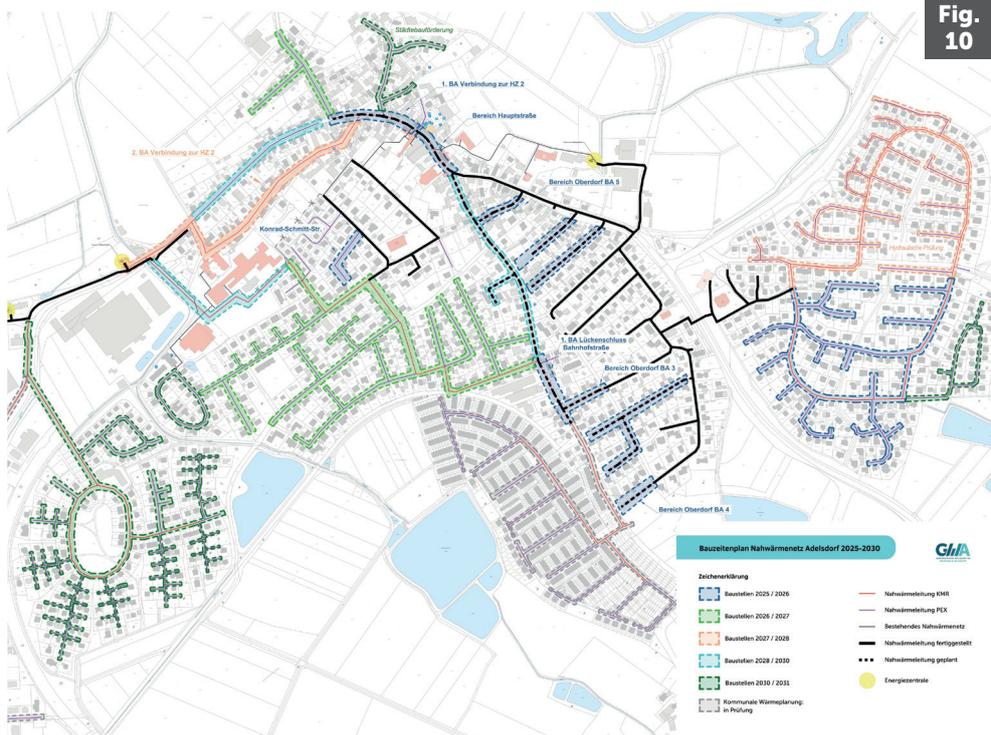


Fig. 10



Fig. 11

sary establishment of municipal structures followed in 2022 with the founding of Gemeindewerke Adelsdorf. There is now a clear roadmap for replacing decentralised fossil-fuelled individual heating systems with the provision of green heat (Fig. 10). For housing companies and building owners, this offers security with regard to the fulfilment of legal requirements in accordance with the Building Energy Act. Adelsdorf is an example of how the necessary decarbonisation of the heat supply can be implemented in small and medium-sized municipalities.

On the western edge of Stralsund in Mecklenburg-Western Pomerania, the B-Plan 39 development area is being built with a total of 11 apartment blocks and 94 single-family homes. SWS is pursuing a clear strategy in Stralsund consisting of transforming the existing heating network infrastructure by successively integrating additional renewable heat sources and expanding the network to replace decentralised fossil heat generators. SWS is using plastic for the first time in B-Plan 39 and is relying on REHAU's expertise and the certified RAUTHERMEX PMR system (Fig. 11). Construction of the network began in spring 2023 and the first buildings have been supplied since the end of 2024. The secondary network is fed from the neighbouring KMR district heating network.

Conclusion & outlook

Accelerated expansion of the heating network infrastructure requires the deployment of additional capacities - especially in specialist planning and construction implementation. For engineering firms that are now (re)establishing themselves in this segment, the business prospects are extremely positive. For civil engineering and pipeline construction companies, training in the processing of polymer pipe systems is becoming significantly more important. This is being driven by clients, e.g. municipal utilities, who are increasingly recognising the potential of PMR. Flexible polymer pipe systems can make a substantial contribution to accelerating the decarbonisation of the heat supply beyond isolated networks when used in secondary and hybrid networks. With the change of material or the combination of KMR + PMR, experience has shown that up to approx. 1/3 of the investment costs can be saved in relation to the PMR part and the construction time can be significantly shortened. The prerequisite for sustainable success in the integration of PMR, even in larger networks, is compliance with guaranteed properties and a focus on durability and quality assurance in the overall system consisting of pipework, pipe connection technology and sleeves for post-insulation.

Sources:

1. Federal Environment Agency: <https://bit.ly/41ymUo8>
2. Federal Ministry of Housing, Urban Development and Building: <https://bit.ly/43ewgXE>
3. Competence centre for municipal heating transition: <https://bit.ly/4i9Moyh>
4. Competence centre for municipal heating transition Final report: Municipal heating planning Eschwege 2024 Q1 <https://bit.ly/3Xlaspj>
5. Kruse, O.: Local and district heating supply for neighbourhoods in small and medium-sized towns. EuroHeat&Power, 50. Jg. (2021), Issue 6
6. Kruse, O.: The Grünheide - a neighbourhood in Bielefeld on the way to climate neutrality. EuroHeat&Power, 51. Jg. (2022), Issue 6



Original Graphic © Minase - stock.adobe.com

BRIGHT TIMES

FOR DESIGNING THE DISTRICT HEATING NETWORKS OF TOMORROW



Author

Olaf Kruse
Senior
Product Engineer
& Project Manager
District Heating
REHAU Industries
SE & Co. KG, Erlangen

A look at the already completed municipal heat plan of cities and municipalities shows that in the coming years, a large number of new and diverse (local) district heating networks will be created in order to decarbonize the heat supply in Germany with economical solutions. The designing of these networks is both an opportunity and a challenge, especially for design engineers. Suitable design tools are needed to successfully handle the complex tasks professionally, with high precision, and at the same time with the necessary flexibility.

Update on the status of the municipal heat planning in Germany

Almost half of all local authorities in Germany are already involved in or in the process of drawing up a municipal heat plan (KWP). And more than 500 local authorities have already comple-

ted the KWP⁽¹⁾. There is a clear disparity between large cities (municipalities with over 100,000 inhabitants) and medium-sized and, above all, small municipalities (**diagram 1**).

Once the heat plan has been finalized and published or approved by the city or municipal council, the actual work begins with regard to the concrete implementation of identified measures. This means that after the municipal heating plan is before the district heating network design and the realization of these networks. Heating network (priority) areas are identified in heating plans. These can be large local or city (sub)networks or smaller clusters at neighborhood level.

The fact is: there are many new heating networks and there will be many more.

This raises the question: Who will design these networks? What specific challenges are there? Are suitable design tools available?

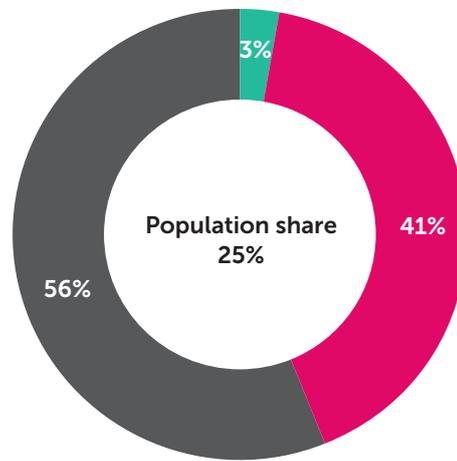
Let's take a look at what this actually involves. As part of the KWP, an initial, usually still very rough, network concept is usually drawn up, including an indicative network calculation based on the determined heating requirements and taking into account the development of demand due to possible refurbishment of the buildings. The supply concepts take into account the regionally economically viable renewable energies, including the potential of unavoidable waste heat. The results obtained here generally form the basis for subsequent network designs⁽⁵⁾. The next steps are as follows: Preparation of a feasibility study, e.g. subsidized by the Federal Fund for Efficient Heating Networks (BEW), with service phases 1-4 according to HOAI (= module 1 of BEW)⁽⁴⁾. This work is carried out by engineering and design offices, engineers at municipal utilities and contractors and is widely supported by system manufacturers such as REHAU⁽⁵⁾. In the course of this work, the district heating network takes on more and more shape, concrete challenges and the possible complexity become clearly visible. The results of the study then provide a basis for decision-making so that – if the results are positive and the decision is made by those responsible – implementation can begin. Based on the current BEW funding system, this means applying for Module 2 and starting the construction design (service phase 5).

Concrete challenges in the Design of district heating networks

An (initial) cost estimate is already required as part of the concept development process. This involves evaluating which factors significantly influence the costs. Focussing on material and processing, the question arises as to whether and to what extent plastic jacket pipe systems (KMR) with steel media pipes or polymer pipe systems (PMR) with PE-Xa media pipes can be used, possibly also in combination. The fact is that the use of PMR is becoming increasingly interesting for many municipal utilities as builders of new networks,

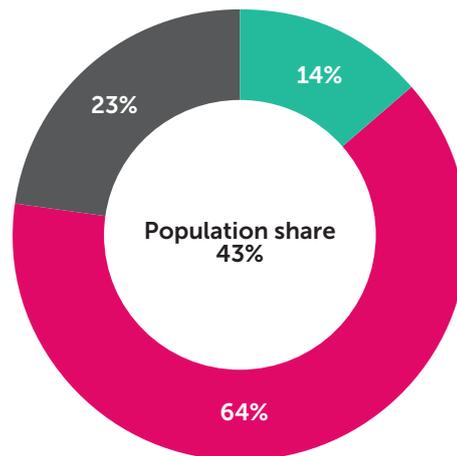
■ Completed
 ■ in process
 ■ Status unknown

Diagram 1: Status of municipal heat planning in small, medium-sized and large municipalities in Germany ⁽²⁾



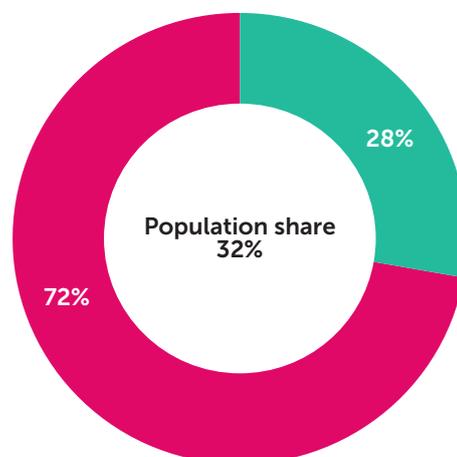
Small municipalities (under 10,000 p.e.)

comprises 9,149 municipalities



Medium-sized municipalities (10,000 to 100,000 p.e.)

comprises 1,543 municipalities



Large municipalities (over 100,000 p.e.)

comprises 83 municipalities

A total of 10,755 municipalities. Territorial status on 31.12.2023 according to the list of municipalities of the Federal Statistical Office. Uninhabited areas excluded. As at June 2025. Graphic: dena/KWW – Source: KWW (2025) – (The color of the graphic has been adjusted for editorial reasons.)



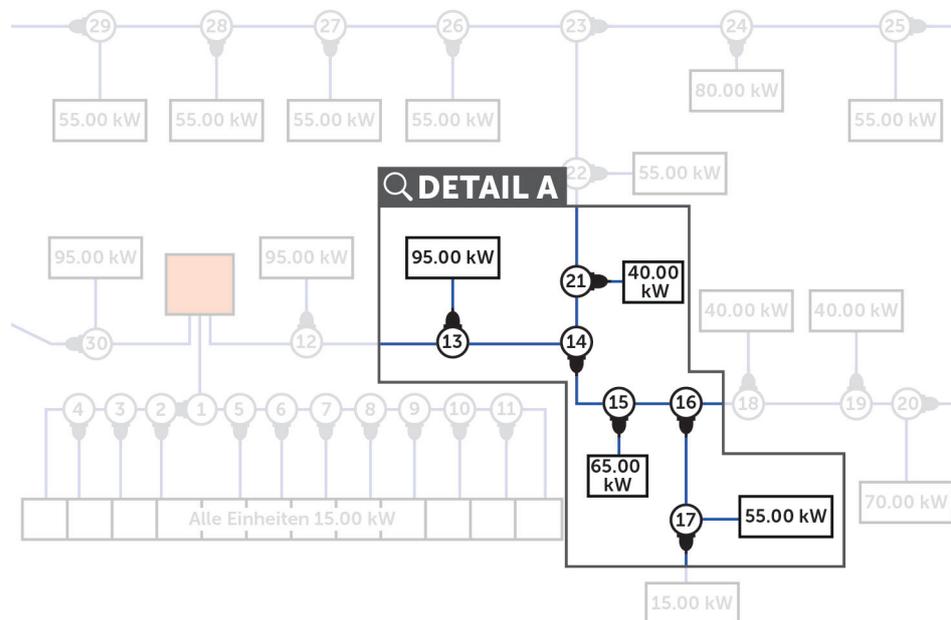
as these system solutions are quick and easy to plan and install, with a significant cost-saving potential of up to a third⁽⁶⁾. It is also clear that the complexity of projects is increasing significantly across the board. One example is the consideration or integration of several heating supply systems based on the local sources of renewable energy identified as part of the KWP. In addition, expansion plans and the subsequent integration of green heat and power generation plants must be taken into account in order to ensure sustainability. And: project development and design is becoming increasingly dynamic. Flexibility is therefore required to be able to react in a targeted manner to frequent short-term changes to the boundary conditions in the planning process. One example of this is the selection of locations for heat sources. If locations are changed during the design process, this usually means a complete recalculation of the network hydraulics with corresponding effects on costs. A supposedly often underestimated aspect: securing the budget framework through precision, depth of detail and transparency in the design. This involves the feasibility of network construction through the integration of component libraries in order to avoid problems during subsequent implementation. The flexibility of PMR can make a significant contribution here with

regard to the design and construction of new networks for existing buildings. In the event of unforeseen underground construction situations, for example, a solution can be found quickly and cost increases can be avoided or at least kept to an absolute minimum.

Figure 1 shows an example of a district heating network design with the simplified representation of a branch situation that is very common today. The level of detail is limited to the basic routing with the branches (junctions) and house connections. In terms of feasibility, however, this design is still inadequate. For the marked network section "Detail A", Figure 2 shows how, taking into account the use of PMR with the appropriate components (including the transition from two single pipes to a double pipe by means of a so-called Y-pipe), the ready-to-implement representation can look in principle. Powerful design software should come as close as possible to this level of detail in the future.

Of course, the focus is also on precise network hydraulics. Maximum efficiency is a "must-have", oversizing and unnecessary ("hidden") reserves must be avoided in order to ensure economical network operation in the long term. This includes, among other things, calculating the diversity fac-

Figure 1:
Section of a district heating network – simple representation of the corridors or pipes with junctions and house connections (source: REHAU)



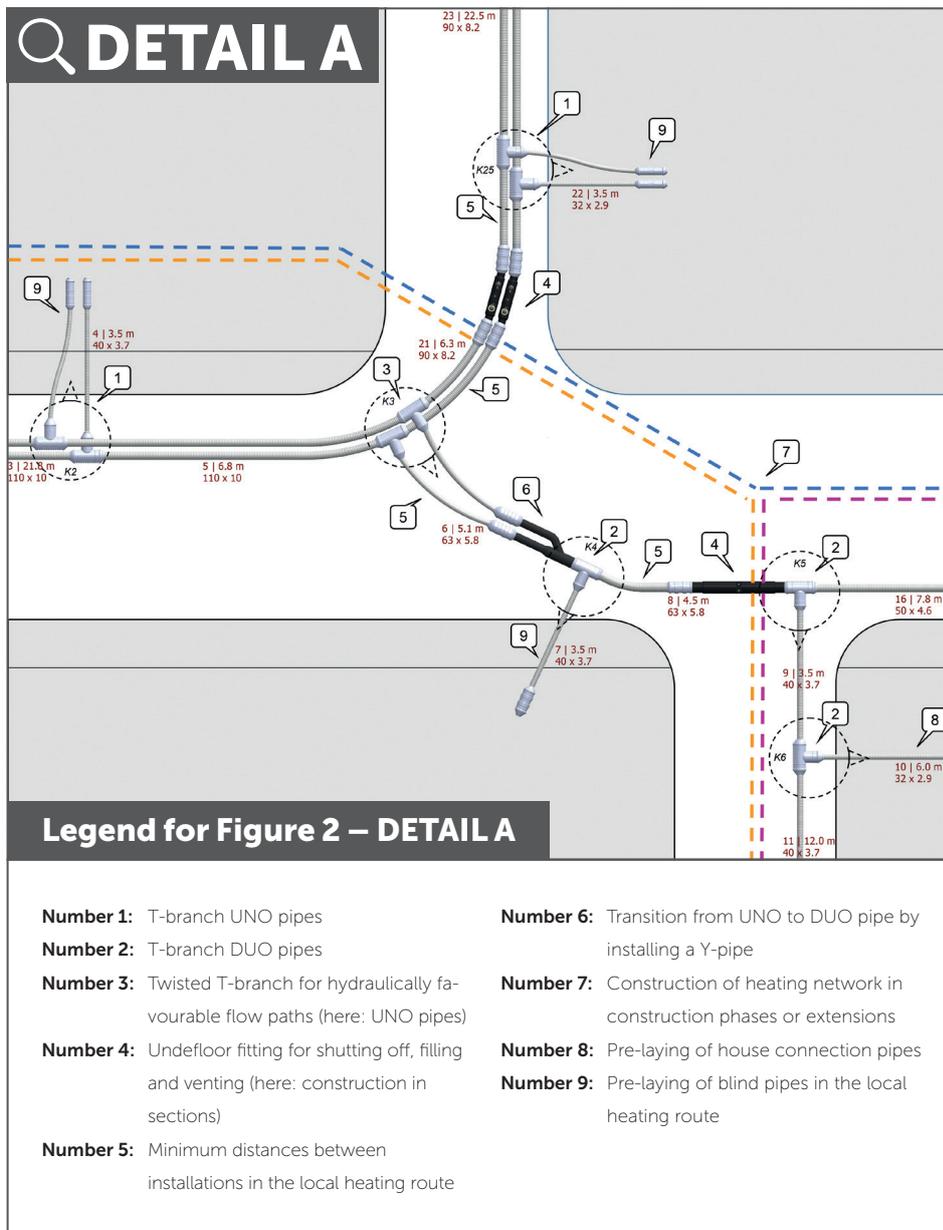


Figure 2: District heating network detail illustrating a high level of detail with regard to the design with the specific degrees of freedom and components. (Source: REHAU)

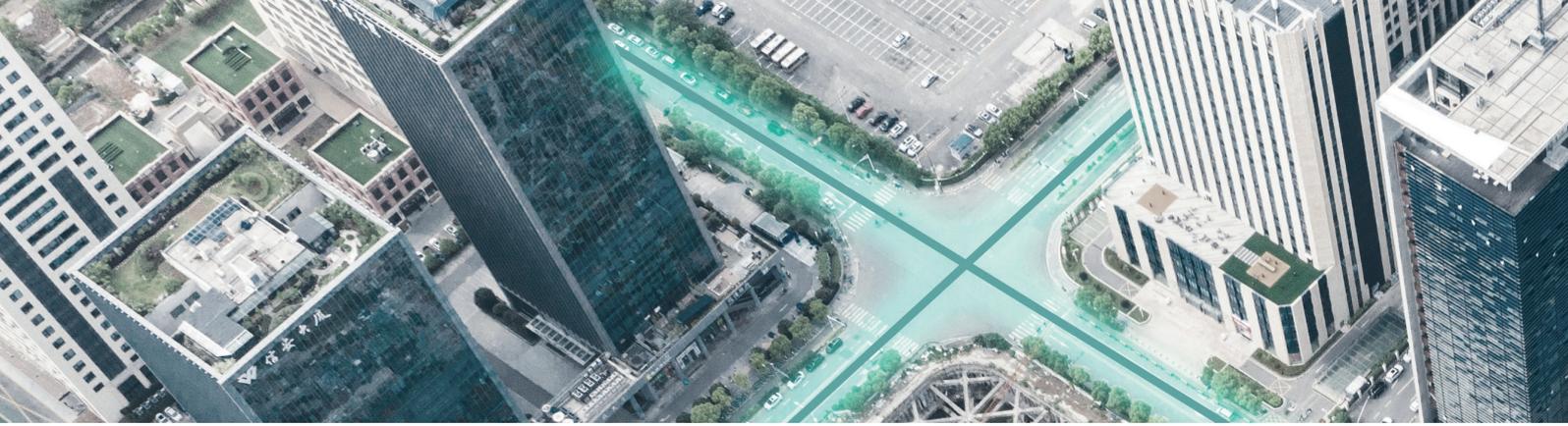
tors for each individual piping route section and consequently minimizing the pipe size on the basis of the damping effect of the diversity factor.

In addition, it must be possible to quickly and easily analyze supply and network expansion scenarios in terms of their impact on the design. For example, it is necessary to analyze what happens if a ring closure or meshing of the network takes place. What effects does this have on the security of supply in the context of integrating several heating distributors? Equally important are calculations for a changed connection

rate with regard to pipe dimensioning that makes economic sense in the long term. The geodetic heights also play a decisive role in the dimensioning of such networks and have an influence on the calculation of the maximum pressures.

Software solutions for network design – Status quo and outlook

There are already a number of software solutions for development of district heating networks. New tools have been developed in recent years, particularly in the context of the KWP, which deliver good results quickly, especially in the early project



phase. However, these solutions are more or less limited and often not suitable for processing up to the construction stage. Against this backdrop, a new digital solution is currently being developed through a collaboration between LINEAR and REHAU, drawing on decades of experience in heating network design. This solution is based on the established AutoCAD system platform. With the implementation of a comprehensive and very powerful new design and calculation module, the result for users will be THE SOLUTION for sustainable district heating network design. The range of applications covers all relevant areas:

- Neighborhood concepts for new and existing buildings
- Larger district heating networks in municipalities and cities
- From the first draft to ready for installation
- Network expansion and network extensions

Figure 3:
Heating network in a district with two heating centers and meshing (Source: REHAU)





A selection of features:

- Calculation of ring and mesh networks
- Consideration of multiple energy or heating centers incl. automatic recalculation in the event of a change of one or more locations
- Consideration of the geodetic heights in the network
- Comprehensive component library

Heating networks, as shown in **Figure 3** can be professionally processed up to the construction stage in the future. The new solution will be available from the beginning of 2026 and will make a substantial contribution to speeding up the design of district heating networks overall.

Sources:

- (1) **Competence Centre for Municipal heat transition (KWW):**
<https://bit.ly/3HuY2X5> (data retrieval 24.07.25)
- (2) **Competence Centre for Municipal heat transition (KWW):**
<https://bit.ly/45L9g2Z> (data retrieval 24.07.25)
- (3) **Kruse O.:**
Municipal local heating networks to decarbonize the heat supply
Article in LINEAR AKTUELL, issue 1/2025
- (4) **Federal funding for efficient heating networks:**
<https://bit.ly/45gUkK1>
- (5) **The REHAU 360° service as part of the part of the REHAU local heating DNA:**
<https://bit.ly/4mEkdck>
- (6) **Kruse, O.:**
Accelerating network expansion with secondary and hybrid networks EuroHeat&Power,
53. Jg. (2024), issue 4-5

About the author

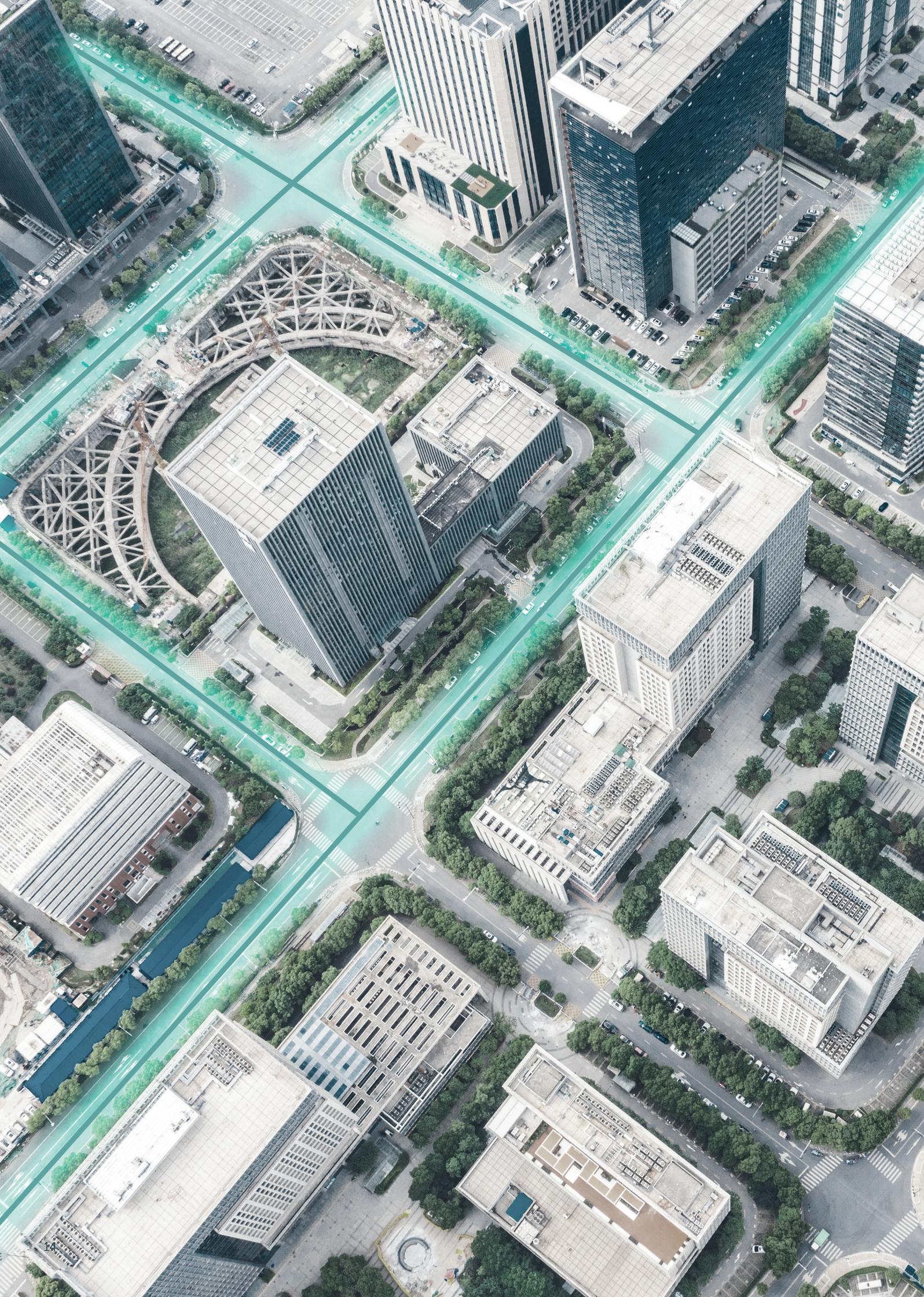
Olaf Kruse
Senior Product Engineer
& Project Manager District Heating
REHAU Industries
SE & Co. KG, Erlangen

Kontakt:

REHAU Industries SE & Co. KG
Ytterbium 4, 91058 Erlangen
Tel.: +49 9131 92-5346
E-Mail: Olaf.Kruse@rehau.com
<https://gebaeudetechnik.rehau.de>

Olaf Kruse has been working in the energy supply industry since 1995, initially in the field of consulting and design, specializing in geothermal systems. In 2004, he moved to the industry, joining polymer specialist REHAU with responsibility for the product development of solar thermal systems and potable water heating systems. Since 2013, he has been contributing his extensive experience as a product engineer and project manager to district heating projects throughout Germany.





PLANNING AND CALCULATING DISTRICT HEATING NETWORKS

FROM THE PIPE ROUTE TO EXECUTION

This third article picks up exactly where the previous one left off and focuses on practical implementation in the planning process:

It describes how local heating networks are planned using the specialized software LINEAR Analyse District Heating for calculation and design—from structured network layout and hydraulic calculations to detailed, construction-ready designs. In addition to the software's features, this section highlights its unique selling points compared to other solutions by examining a typical planning workflow—particularly in areas where traditional "early-phase tools" reach their limits and where end-to-end planning up to execution is required, with high transparency and the ability to respond quickly to changes.

Which tasks is LINEAR Analyse District Heating best suited for?

The software is designed for the technical planning of local and district heating networks – specifically for the stage in which a network concept is transformed into a calculable, execution-ready CAD model. A key benefit is the combination of CAD-based modeling and reliable network cal-

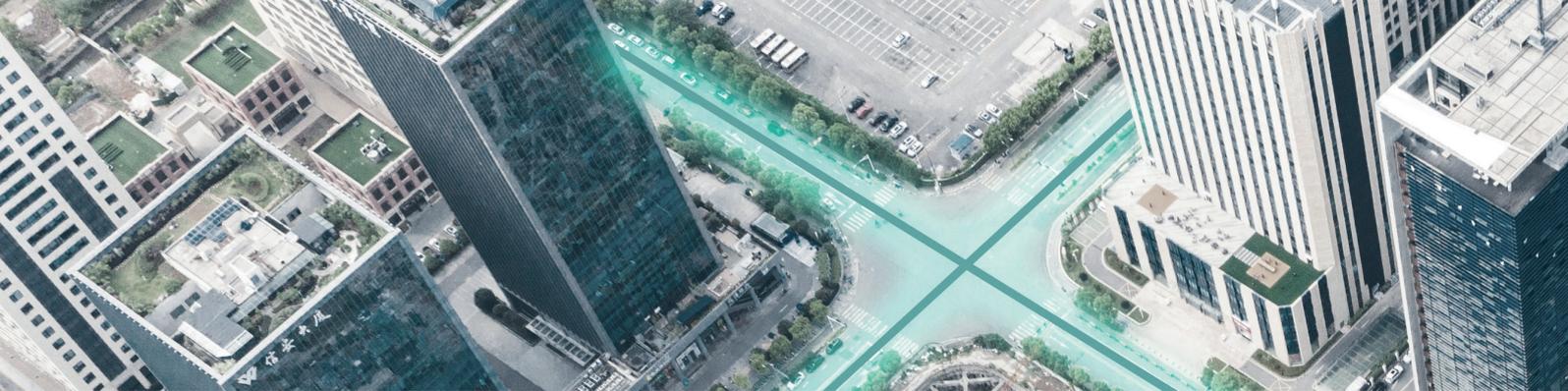
culatation based on field-proven rules and design logic, which were incorporated into the development process through the collaboration between LINEAR and REHAU. This creates a seamless workflow from pipe route planning through material selection to the creation of plans optimized for the construction site. In particular, REHAU contributes the perspective gained from real-world projects as well as its expertise in polymer-based local heating systems – with the goal of ensuring that the calculations and the actual execution in the model are consistent with one another.

It is important to clarify: This tool is not intended as a conceptual decision-making aid for the early planning/strategy phase of local or district heating projects (e.g., choosing between a local or district heating network and individual heating systems, rough investment estimates, or selecting service areas). However, it does support cost and quality optimization within a selected network concept through precise sizing, variant calculations, plausibility checks, and material- and execution-specific network layout.



Author

Javier Castell-Codesal
LINEAR Management



Example Workflow: From pipe route to a design ready for execution

A typical project can be best described using a practical workflow, without getting into every single detail of the steps involved. The key point is: LINEAR Analyse District Heating guides you from the very beginning to automatically create a computable model from your drawing, including ongoing validation and clear feedback on missing information.

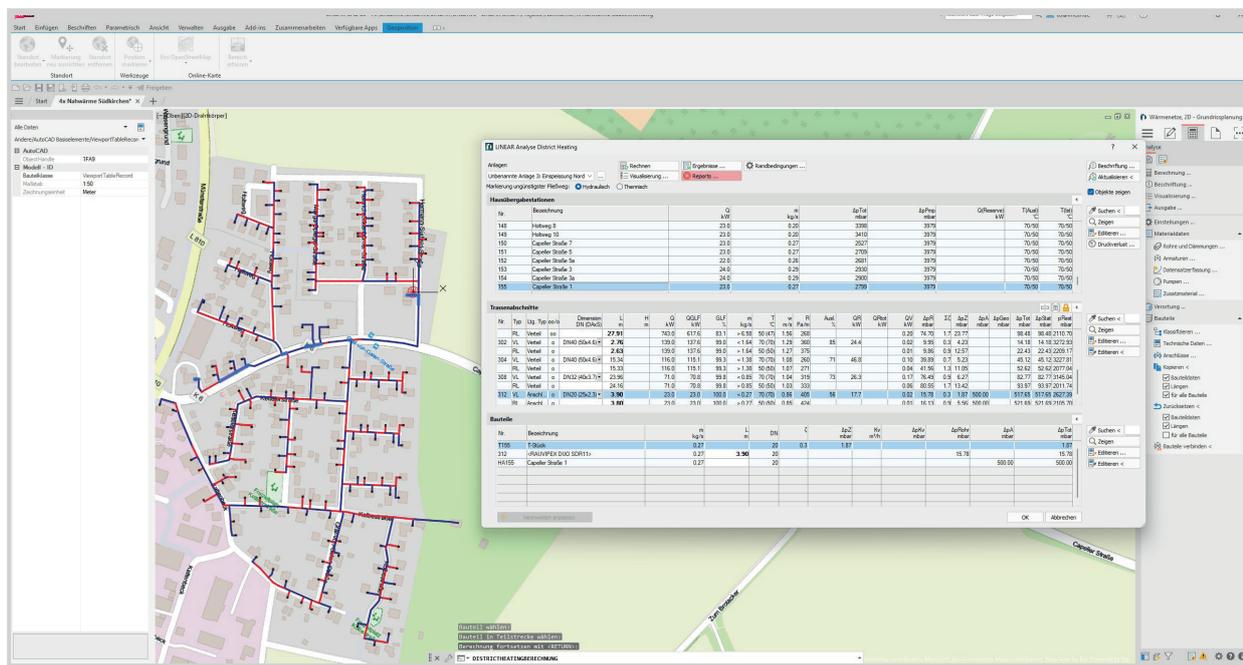
It all starts with "on-site planning." The project is set up with geodetic accuracy (e.g., ETRS89/UTM) so that the aerial image and map background align precisely and the resulting pipe route corresponds to the real-world road network. Depending on the region and the level of detail required, you can switch between different map styles: Aerial view showing the actual street layout, or a map view for orientation. In addition, digital topographic maps and geodata are used to automatically import geodetic elevations into the model and to derive an elevation profile. This step is crucial for network design, as differences in

elevation directly affect the required pressure level and, consequently, the assessment of critical network sections. The inclusion of location and elevation data thus enhances the reliability of the calculation from the outset and facilitates its later application to the construction site.

The pipe route design is based on this. The route is created efficiently and systematically using specialized drawing tools, in such a way that a computable network model is generated directly from it. The CAD-based workflow uses Autodesk AutoCAD, an established platform that is already in use at many planning offices. At the same time, even at this early stage, rules for geometry and data entry serve as guidelines, such as material-dependent constraints like minimum bend radii. This reduces typical follow-up errors that would otherwise only become apparent late in the execution process – and at great cost.

In the next step, a simple line drawing is transformed into a network of technical

Figure 3: Calculation dialog with detailed results





objects. To do this, feed-in points, transfer stations, branches and other network components are placed as elements. This object-oriented approach is crucial: Components carry properties and uniquely represent nodes and transitions. It is precisely this clean modeling logic that ensures that calculations, evaluations, and material lists will function reliably later on—not as post-editing, but as a direct result of the modeling process.

Once the network has been set up as a model, network detection and data validation start. This is where LINEAR Analyse District Heating really shines. The network is automatically checked when the calculation starts. Missing or implausible data points are written into a report and can be selected directly in the model using the "Show" button. This creates a highly practical workflow: check, identify, correct, and continue working—without having to spend time searching through the project and with clear documentation of any unresolved issues.

The data entry system is designed to remain scalable, whether for small neighbourhoods or larger municipal networks. Performance data and design parameters are collected for each component—depending on the workflow, either via property panels or component lists with filtering and sorting logic. This is particularly helpful when the project involves different types of buildings that need to be handled in groups: for example, different building categories (renovated vs. new buildings), different connection scenarios, or simultaneity. The simultaneity approaches are not rigid but can be adapted on a regional basis. In addition, the component list remains closely linked to the CAD model: When you select an item from the list, you are taken directly to the object on the plan, allowing you to maintain a visual reference at all times.

Once data collection is complete, you can perform the calculation – and this is where the quality of the model and data logic really pays off. The configuration takes into account actual material properties and employs proven dimensioning strategies derived from REHAU's decades of experience in district heating network systems. Critical issues, such as excessive flow velocities or unacceptable pressure conditions, are not only logged in the report but can also be highlighted in the model. Visualizations—such as color-coded representations of nominal diameters – make problematic areas easy to spot and ensure a comprehensive assessment of the plan.

A key benefit then arises from the ability to create variants and optimize the design. In real-world projects, conditions often change: Pipe routes are adjusted, pressure setpoints are modified, additional generators are considered, or network sections are to be meshed. LINEAR Analyse District Heating is designed to incorporate such changes into a new, dependable calculation without any disruption. This allows for the targeted use of meshing or ring main closure to reduce flow velocities and increase network stability. It is also possible to map multiple feed-in points with defined shares. This is a key consideration for realistic expansion and transition pathways, in which networks grow gradually and renewable energy generators are integrated step by step. In addition, material scenarios can be evaluated, for example by adding additional pipe systems and implementing automatic material changes based on the determined dimensions. This is where REHAU's system expertise comes into play, particularly in cases where material-specific constraints (e.g., bending radii, delivery forms/bundled coil lengths, component logic) affect design feasibility and material allocation.

The workflow concludes with material take-off and plan derivation—the link bet-



ween the calculation and the construction site. Material take-offs can be generated from the model either in full or selectively, for example, in sections for construction phases, progress payments, or purchase orders. Tools for drawing frames, scales, labels, and customization are available for documentation and printing for the construction site. Labels remain dynamic and update automatically when performing calculations. This means the tool doesn't only perform hydraulic calculations, but consistently supports the execution-ready material and layout logic, including positioning.

Other strengths that often go unnoticed in the workflow

A major advantage of LINEAR Analyse District Heating is its seamless integration into the existing LINEAR environment. For users who are already working with LINEAR, this means: familiar operating logic, consistent data management, and minimal adjustment required. At the same time, new users also benefit from a cle-

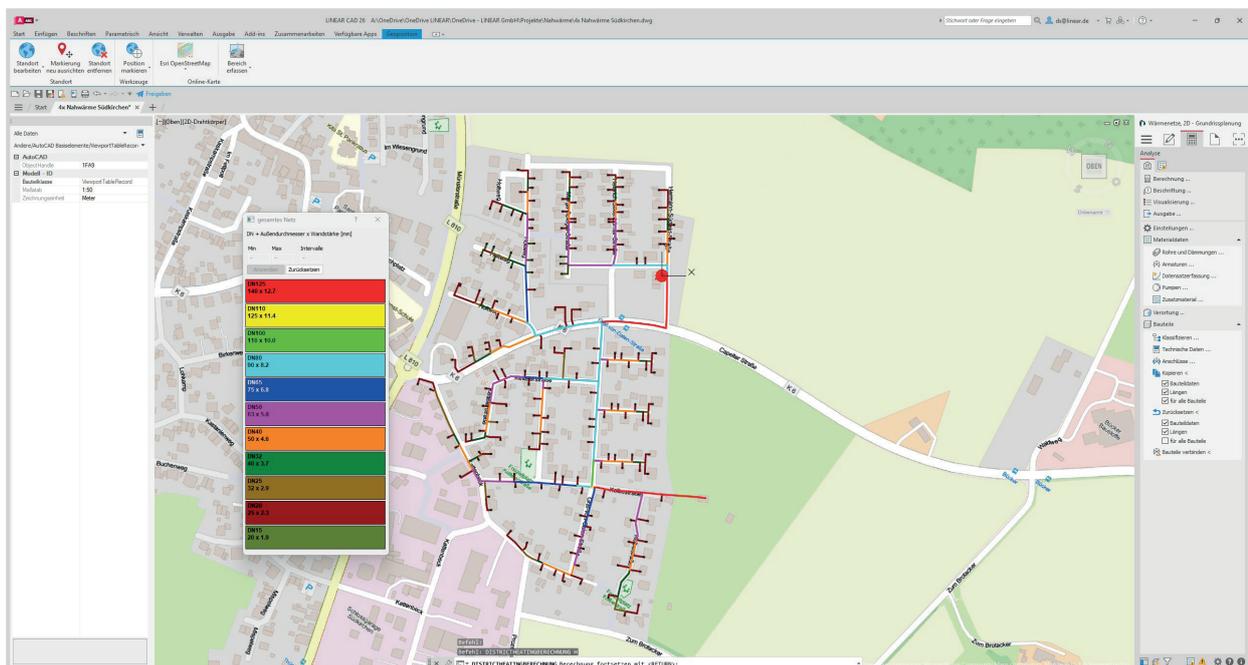
arly structured, CAD-like workflow that perfectly mirrors the way planning offices operate.

Furthermore, the software solution is not only intended for "greenfield" projects. Especially in a municipal context, it is often necessary to expand networks in stages, retrofit pipe sections, or validate and expand existing networks. This logic is built into the tool—both in terms of modeling as well as comparing variants and deriving material.

Data import and export are also important for collaboration with clients, utility providers, or GIS environments. This is an aspect that plays a key role in quality assurance for larger projects.

After all, LINEAR Analyse District Heating is designed for teamwork and standardization: Cross-project settings can be defined as office standards and can be shared. At the same time, the necessary flexibility is maintained to make project-specific "fine-

Figure 4:
Visualization of the
calculated dimensions in
the network





tuning”—right down to individual nodes, junctions, or building connections.

Summary and Conclusion

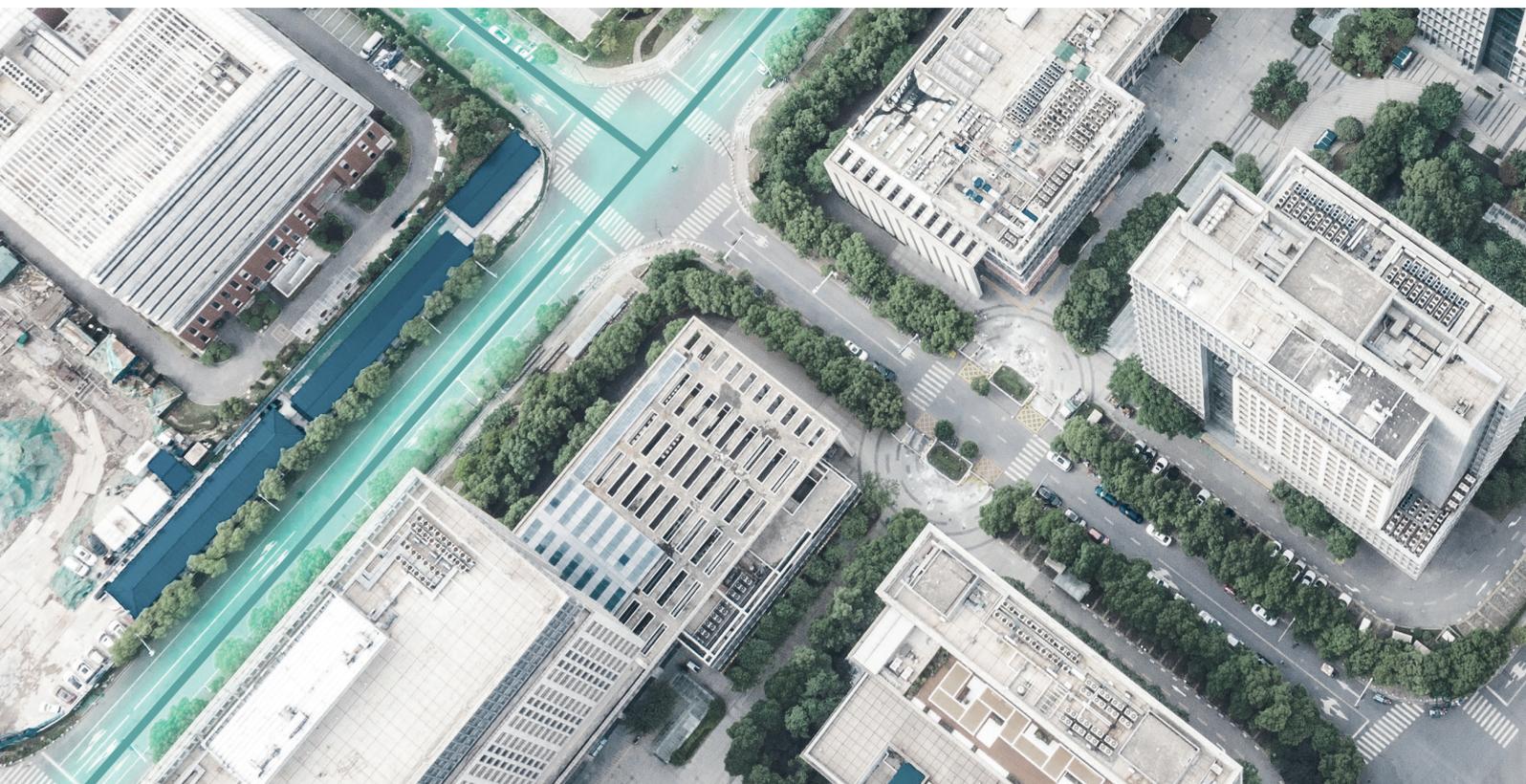
The software specifically addresses the gap between an "idea of a network" and "detailed planning": It enables CAD-based, professionally verifiable, and optimizable heating network planning with a high degree of transparency—from georeferenced pipe routes and component-specific data collection to robust error and plausibility checks, as well as variant calculations (meshing, feed-in, materials), detailed material lists, and plans suitable for the construction site.

This means it is not a tool for making fundamental conceptual decisions in local and district heat planning, but rather a highly effective tool for the precise planning, cost optimization, and readiness for implementation of a selected network concept – especially in projects with dynamic constraints and expansion paths. The key difference from many early-stage tools is

its consistent focus on readiness for implementation, supported by the combination of LINEAR's expertise in planning software and REHAU's practical experience, as well as material system know-how, which is incorporated into the dimensioning logic, material data, and system mapping.



Release: Early May 2026, Version 26.1.



Would you like a personal consultation?

Contact us via

www.linear.de/en/district-heating



LINEAR
THE BIM ENGINEERING SOFTWARE



REHAU

Water
Technologies